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A photobioreactor design for large-scale microalgae cultivation

ABSTRACT

Microalgae are a promising alternative feedstock for producing biofuels (e.g., bioethanol and biodiesel) and bio-products (e.g., omega-3 and chlorophyll). However, the high cost of developing products from microalgae remains an obstacle to the full use of microalgae. Major hindrances to the commercial viability of algae are the operational and maintenance costs associated with large-scale cultivation. Most microalga cultivation operations rely on improvised photobioreactor designs, of which open-pond systems are frequently considered for large-scale operations. A cost-effective cultivation method is needed to improve the sustainability and economics of microalga cultivation, whilst minimising space and culture contamination and maintaining the integrity of desired species. Several photobioreactor designs are reviewed for the effective cultivation of microalgae, and the advantages and limitations of these photobioreactors are highlighted. Process challenges to scaling up the design of photobioreactors for commercial operations are also discussed.